Reg. No ..... Name **22U618**

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2022

SEMESTER 6 : PHYSICS

COURSE : **19U6CRPHY10: RELATIVITY AND SPECTROSCOPY**

(For Regular - 2019 Admission)

Time : Three Hours Max. Marks: 60

PART A

Answer any 8 (2 marks each)

1. Differentiate between inertial and non inertial frame of reference.
2. Write the Galilean transformation equations.
3. What is time dilation?
4. What are the different types of energy possessed by a molecule?
5. In Raman spectra, stokes lines are more intense than anti stokes lines. Why?
6. Under what circumstance do a molecule exibit Raman spectra?
7. Represent the energy levels of a spin half system in an external magnetic field B =B0 in the case of NMR.
8. State Pauli's exclusion principle.
9. What is Bohr Magneton?
10. Illustrate the electronic configuration of an atom with atomic number 27

(2 x 8 = 16)

PART B

Answer any 6 (4 marks each)

11. Calculate the length of a rod moving with a velocity 0.6c in the X-Y plane in a direction inclined at 45^0 to the X - axis. Proper length of the rod is 1m.
12. A clock keeps correct time. With what speed should it be moved relative to an observer so that it may seem to lose 2 minutes in 24 hours.
13. Define the three principal moments of inertia of a rotating molecule.
14. Raman spectrum of Benzene showed lines corresponding to Raman shifts at 608 and 846cm-1. What would be the Raman wavelength if Benzene is exposed to light of wavelength 546.1nm
15. Explain the principle of NMR.
16. Electron spin resonance is observed for atomic hydrogen with an instrument operating at 10GHz. If the g value for the electron in the hydrogen atom is 2.0026, what is the magnetic field applied? Bohr magnetron $\mu_B = 9.274 \times 10^{-24}\ JT^{-1}$.
17. Distinguish line, band and continous spectra with examples
18. Explain the fine structure of Sodium D lines on the basis of vector atom model.

(4 x 6 = 24)

PART C

Answer any 2 (10 marks each)

19. Derive Einstein's mass energy relation.
20. Discuss the classical theory of Raman effect and also memtion its failure.
21. Discuss the theory of rotational spectrum of a diatomic molecule treating it as a rigid rotator.
22. What are the postulates of Bohr atom model? Deduce the expression for the radius and energy of nth orbit.

(10 x 2 = 20)